

First record of the alien seed beetle *Stator limbatus* (Coleoptera, Chrysomelidae, Bruchinae) from Cyprus

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Received 28 January 2022 | Accepted 17 March 2022 | Published 30 June 2022

Citation: Demetriou J, Kakiopoulos G, Háva J, Martinou AF, Delobel A (2022) First record of the alien seed beetle *Stator limbatus* (Coleoptera, Chrysomelidae, Bruchinae) from Cyprus. *Travaux du Muséum National d'Histoire Naturelle "Grigore Antipa"* 65(1): 37–43. <https://doi.org/10.3897/travaux.64.e81350>

Abstract

The subfamily Bruchinae includes the majority of alien to Europe Chrysomelidae. Up-to-date, seven alien seed-beetle species have been collected from Cyprus affecting ornamental plants and stored products. During the last decade *Stator limbatus* (Horn, 1873), a New World species has been gradually reported invading Middle-Eastern countries and Mediterranean islands. In this publication, *S. limbatus* is recorded for the first time from the island of Cyprus. Specimens were collected from *Ficus microcarpa*, *Eucalyptus* sp. and *Delonix regia*, with the later species being confirmed as a suitable host for *S. limbatus*. The alarming presence of *S. limbatus* in both urban and protected areas raises some questions about any adverse effects on native biodiversity and socioeconomic parameters. The general lack of knowledge regarding the Bruchinae fauna of Cyprus hampers research endeavours for possible agonistic behaviour between native and alien species for resources and host-plants.

Keywords

alien species, biological invasions, Mediterranean, seed-beetles.

Introduction

The number of alien species has been steeply rising across the world mainly due to climate change, international commerce and globalization (Hulme 2009). Insects represent one of the most numerous organismic groups of alien species, with the largest number of species in Europe corresponding to the order Coleoptera (Roques 2010). Seed beetles have been identified as the most frequent alien invaders within the family Chrysomelidae (Beenen and Roques 2010; Yus-Ramos et al. 2014), with their impact mainly inflicting losses to stored products and crop yields rather than adversely affecting native biodiversity (Beenen and Roques 2010). Nevertheless, alien seed beetles have managed to establish viable populations and become integrated in ecosystems within their invaded range, especially in Mediterranean countries (Yus-Ramos et al. 2014).

At least 42 *alien-to-Europe* seed beetles (Coleoptera: Chrysomelidae: Bruchinae) have been introduced to the continent and neighbouring Asian countries (Yus-Ramos et al. 2014). In Cyprus, seven alien Bruchinae have been identified namely, *Acanthoscelides macrophthalmus* (Schaeffer, 1907), *Acanthoscelides obtectus* Say, 1831, *Bruchus pisorum* (Linnaeus, 1758), *Bruchus rufimanus* Bohemann, 1833, *Callosobruchus chinensis* (Linnaeus, 1758), *Caryedon serratus* (Olivier, 1790), and *Pseudopachymerina spinipes* (Erichson, 1833) (Morris 1937; Georghiou 1977; Vassiliou and Papadoulis 2008; Beenen and Roques 2010; Demetriou 2021). These species have been primarily associated with stored products (Georghiou 1977) as well as ornamental plants, e.g., *A. macrophthalmus* in *Leucaena leucocephala* (Lam.) de Wit and *P. spinipes* in *Vachellia farnesiana* (L.) Wight et Arn (Georghiou 1977; Vassiliou and Papadoulis 2008), where they develop in seedpods.

Native to the New World, *Stator limbatus* (Horn, 1873) has been accidentally introduced to the Middle East, where up-to-date it has been reported from Iran, Oman, the United Arab Emirates and Yemen (Boroumand 2010; Delobel 2011). The species has also been intercepted at Lattakkia Port Quarantine Station, Syria in 2011 (A. Delobel unpubl. data). Recently, *S. limbatus* has been recorded in Europe, from France (Corsica) and Italy (Sardinia) (Cocco et al. 2021). The species has been regarded as polyphagous feeding on seeds of various Fabaceae such as representatives of the genera *Acacia* Mill., *Albizia* Durazz., *Cassia* L. *Cercidium* Tul., *Leucaena* Benth., *Pithecellobium* Mart., and *Senegalia* Raf. (Delobel 2011; Coco et al. 2021). Furthermore, *Delonix regia* (Bojer ex Hook.) Raf. has been suggested as a possible host for the species (Kingsolver 2004) but this report remains uncertain (Cocco et al. 2021).

Methods

Specimens examined

CYPRUS • 5 specimens; Paphos, Konia; 34.7885°N; 32.4527°E; alt. 165 m; 02 March 2021; E. Kiliarou and J. Demetriou leg., A. Delobel det., collected dead from sealed *D. regia* seedpods in house garden; despite the large number of individuals only 5 specimens were collected. • 1 specimen; Paphos, Chloraka, Melanos; 34.7920°N; 32.4073°E; alt. 75 m; 07 January 2022; J. Demetriou leg.; A. Delobel det.; collected from ornamental *Ficus microcarpa* L.f. 1782, in rolled-up leaf infested by *Gynaikothrips uzeli* (Zimmermann, 1900) (Thysanoptera: Phlaeothripidae); • 1 specimen; Akrotiri UK Sovereign Base Area, Akrotiri marsh; 34.6268°N; 32.9393°E; alt. 0 m; 10 March 2021; J. Demetriou leg., A. Delobel det.; collected from *Eucalyptus* sp. leaves and flowers using a beat-sheet (Fig. 1) (Table 1).

Maps

Maps were created using QGIS Version 3.18.2 free and open source Geographic Information System (<https://qgis.org/en/site/>).



Figure 1. Habitus of *Stator limbatus* (Horn, 1873), male, dorsal view (photographed by Dr A. Delobel).

Table 1. List of localities

Country	District	Locality	Date	Latitude (DD)	Longitude (DD)	Altitude (m)	leg.	det.	Notes
Cyprus	Paphos	Konia	02.III.2021	34.7885°N	32.4527°E	165	E. Kiliarou and J. Demetriou	Dr A. Delobel	collected dead from sealed <i>Delonix regia</i> (Bojer ex Hook.) Raf. seedpods in house garden; Despite the large number of individuals only 5 specimens were collected
Cyprus	Paphos	Chloraka, Melanos	07.I.2022	34.7920°N	32.4073°E	75	J. Demetriou	Dr A. Delobel	1 specimen collected from ornamental <i>Ficus microcarpa</i> L.f. 1782, in rolled-up leaf infested by <i>Gynaikothrips uzeli</i> (Zimmermann, 1900) (Thysanoptera: Phlaeothripidae)
Cyprus	Akrotiri UK Sovereign Base Area	Akrotiri marsh	10.III.2021	34.6268°N	32.9393°E	0	J. Demetriou	Dr A. Delobel	1 specimen collected from <i>Eucalyptus</i> sp. leaves and flowers using a beat-sheet

Results and discussion

Stator limbatus is reported for the first time from the island of Cyprus, updating our knowledge regarding the distribution of this alien species in the Middle East and the Mediterranean (Fig. 2). Given its wide range of known hosts present on the island as well as collection from both Paphos and Limassol districts with surveyed localities being more than 50 km apart, the species is hypothesized to be widely distributed in the country.

Delonix regia is confirmed as a suitable host-plant for the species (Kingsolver 2004), as evidenced by the numerous holes on seeds and the large number of dead individuals discovered in the plant's seed pods in Paphos. Laboratory experiments on the suitability of *D. regia* as a host plant of six *Caryedon* spp. Schoenherr, 1823 unveiled that all individuals died in their first larval stage as they could not enter the seeds. However, when seeds were sown in half and a chance to pass the barrier of the integument was given, all species developed normally (Delobel et al. 2000). In addition, research regarding the closely related *Stator vachelliae* Bottimer, 1973 and its host-plant *Parkinsonia aculeata* L. concluded that larvae could not develop in the very hard seeds of the plant, except when a 1st-instar larva managed to find a spot on the seed where the layer of external integument (Malpighi layer) was thinner or absent. The overall percentage of adults emerged was tiny compared to the number of *S. vachelliae* eggs (2/640) (Johnson and Slobodchikoff 1979). This may explain the uncertainty of Kingsolver (2004) regarding the suitability of *D. regia* as a host-plant of *S. limbatus*. Although this hypothesis was not empirically tested, the large number of dead adults we discovered in the seedpods may suggest that eggs were laid on the pods, first instar larvae bored through the pod wall, entered a cracked seed and developed into adults that were unable to bore their way through the woody podwall and died. Thus, emerging adults may be unable to exit the woody seedpod at a later sclerotized developmental stage, except when the outer layer is cracked.

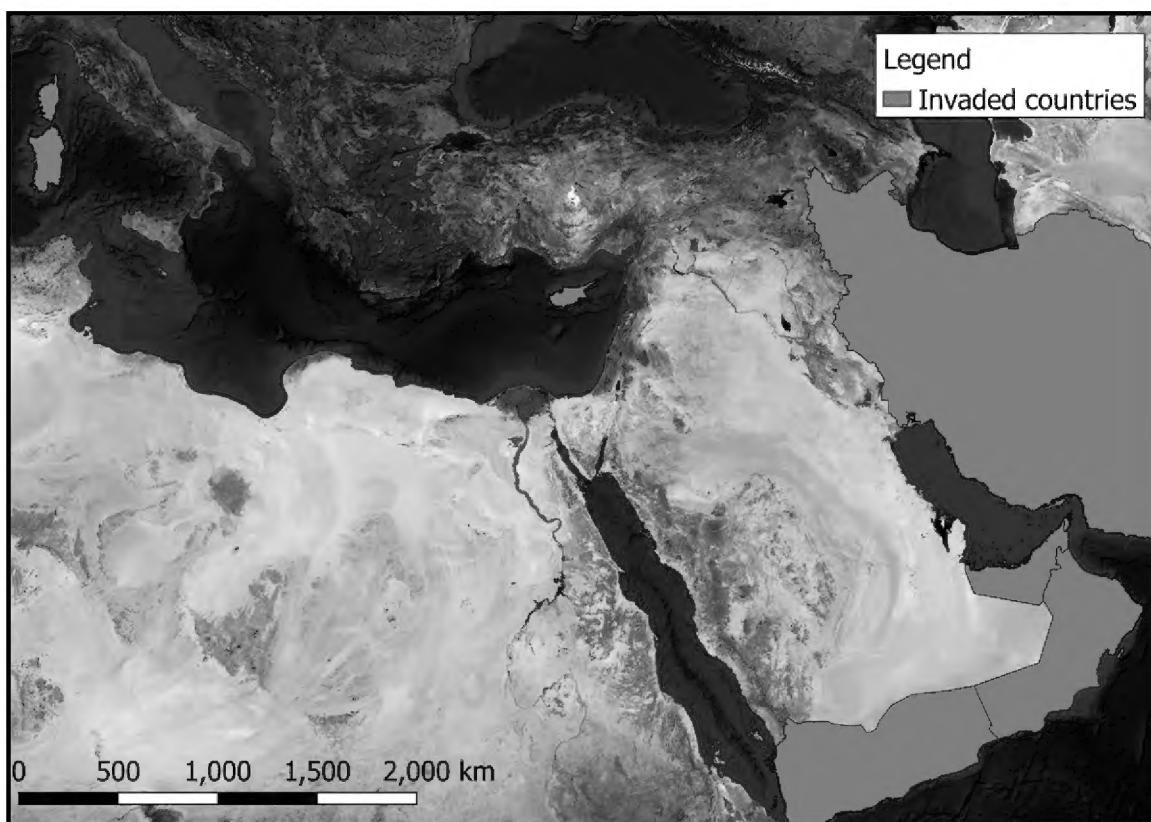


Figure 2. Distribution of *Stator limbatus* (Horn, 1873) in the Middle East and the Mediterranean.

The presence of *S. limbatus* in Akrotiri marsh (RAMSAR site i.e. protected wetland of international importance) raises concerns regarding the establishment of the species in natural ecosystems and especially within protected areas. Although, eucalypts have not been recorded as host-plants for the species, *Acacia saligna* (Labill.) H.L.Wendl. has been found to serve as a suitable host for *S. limbatus* (Cocco et al. 2021) and is abundant in the area (Pescott et al. 2018). Nevertheless, eucalypts might provide nourishment for this polyphagous seed-beetle feeding on pollen. Moreover, despite material samplings performed in Akrotiri Peninsula and Limassol city from February to June 2021 on *A. saligna*, no individuals of the species were found. Considering the specimen collected on *Ficus*, the presence of a lone specimen collected from a rolled-up leaf of *F. microcarpa* is for the moment considered purely opportunistic, as suitable host-plants (*A. saligna*) were observed in the vicinity of the collection site.

Although the species is predicted to cause minor socioeconomic impacts by reducing the performance of alien to Cyprus ornamental plants, further research is due in order to detect any adverse effects of *S. limbatus* on native biodiversity and ecosystem services. The overall low number of studies addressing the Bruchinae fauna of Cyprus i.e. their taxonomy, distribution and ecology (Borowiec and Anton 1993), poses an additional impediment to the research of possible species interrelationships and agonistic behaviour between well-established alien seed-beetles [sensu Yus-Ramos et al. (2014)] and their native counterparts. Furthermore, the lack of continuous efforts in research and monitoring of alien species may fail to detect important biosecurity threats, e.g., reported host shifts of species such as *A. macrophthalmus* already present on the island (Tuda et al. 2009). Thus, systematic work on the Bruchinae of Cyprus is highly encouraged in order to fill our knowledge

gaps as well as facilitate the construction of early warning systems for the detection of new arrivals of alien species on the island.

Acknowledgments

We are highly grateful to Prof Margarita Arianoutsou and Dr Canella Radea (National and Kapodistrian University of Athens, Greece) for overseeing the MSc Thesis during which field surveys in Akrotiri took place. Part of this study was performed under the MSc Thesis of the first author in the program “Ecology and Biodiversity Conservation” at the Department of Ecology and Systematics, Faculty of Biology, National and Kapodistrian University of Athens, Greece. We like to kindly thank Ms Evi Kiliarou for her valuable field work assistance in spotting and collecting infested plant material from Paphos. We are also grateful to our two anonymous reviewers for their corrections and suggestions to our manuscript. Finally, we are thankful to the State Scholarship Foundation of Cyprus (IKYK) and the UK Government through Darwin Plus, for funding this project. The paper was supported by the Ministry of Agriculture of the Czech Republic, institutional support MZE-RO0118 (Jiri Háva).

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